



## **A method for identifying aggressive driving by using naturalistic driving data**

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# **A method for identifying aggressive driving by using naturalistic driving data**

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# Agenda

- Aim
- Data
- Method
- Results
- Conclusions

# Aim

- Identify metrics that can categorize driver behavior associated with higher crash risk
- Aggressive driving in car-following situations
- Investigate effects of drivers characteristics on the identified metrics

# UDRIVE

## NUMBER OF DRIVERS PER COUNTRY:

EUROPEAN NATURALISTIC  
DRIVING STUDY



**87871** HOURS OF  
DATA COLLECTED

VEHICLE  
TYPES



NUMBER OF DRIVERS:

48

186

47

HOURS OF DATA COLLECTED  
PER VEHICLE:

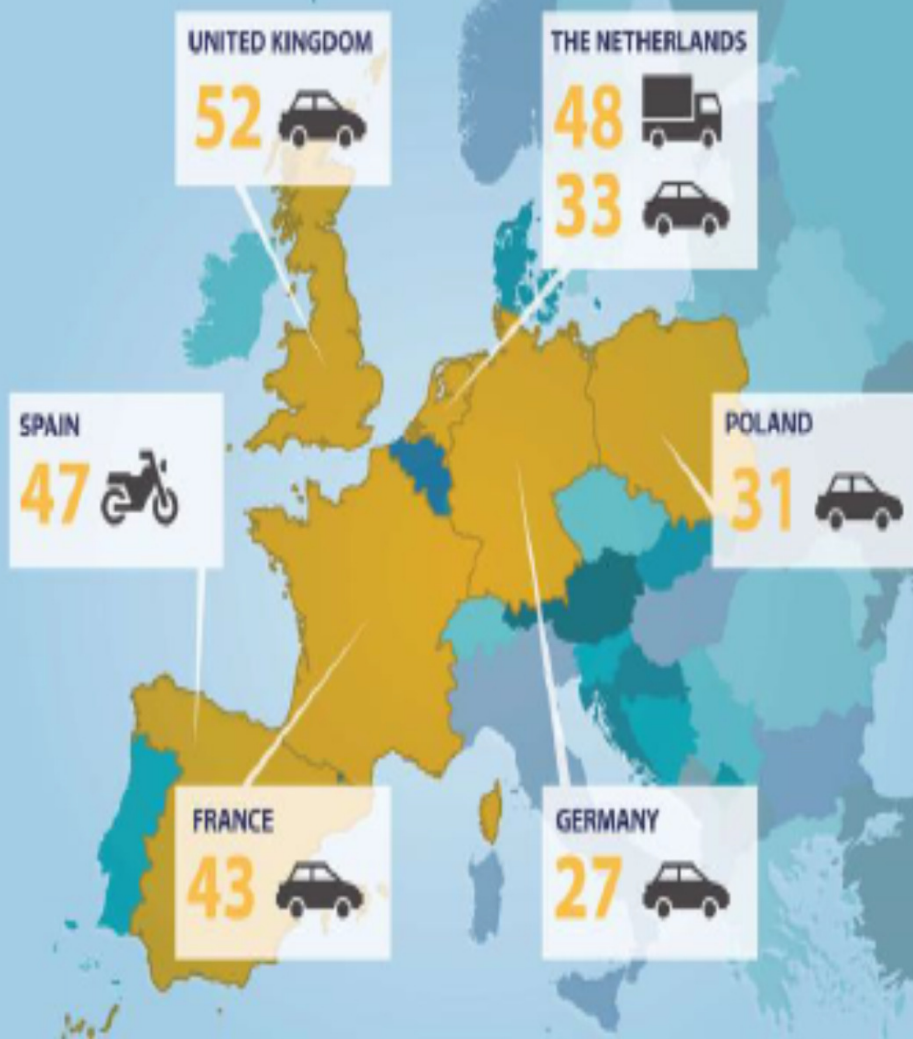
41389

45591

891



NUMBER  
OF DRIVERS  
**281**





UDRIVE demonstration  
video, non-participant  
with consent

CDC data extraction  
on 2017-06-20

# Questionnaires' data



- Driver Behaviour Questionnaires' (DBQ)
  - 19 items assessing the prevalence of errors and violations in the driver's everyday behaviors
  - High score = more reported aggressive driving violations
- Arnett Inventory of Sensation Seeking (AISS)
  - 20 items assessing the risk-taking and sensation-seeking nature of a driver's personality
  - High score = drivers seek out highly novel or high intensity experiences

-Vehicle sensor (V, a)  
-Mobile eye (range)  
-Map data (road type)

-Motorway  
-No CC

Top 25%

Database

Derive  
measures

Select  
scenario

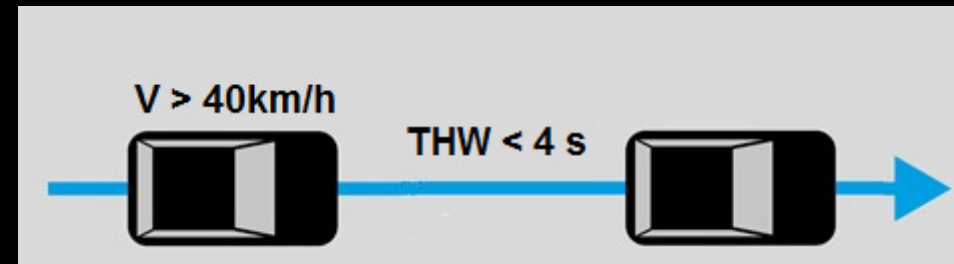
Compute  
metrics

Rank  
drivers

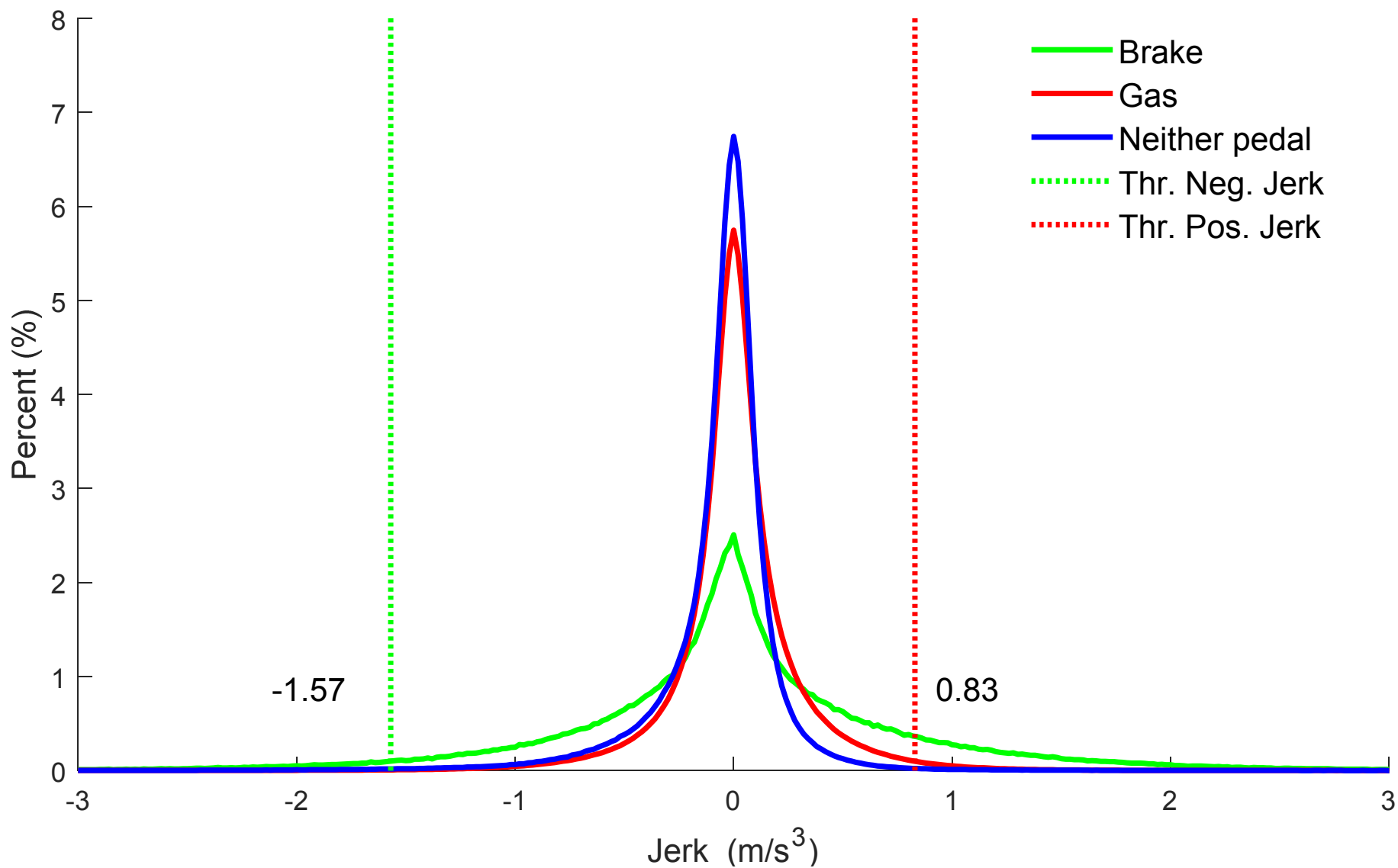
-Longitudinal jerk  
-THW

$$\% \text{ tailgating} = \frac{THW < 0.4s}{THW < 4s} * 100$$

# negative jerk  
# positive jerk



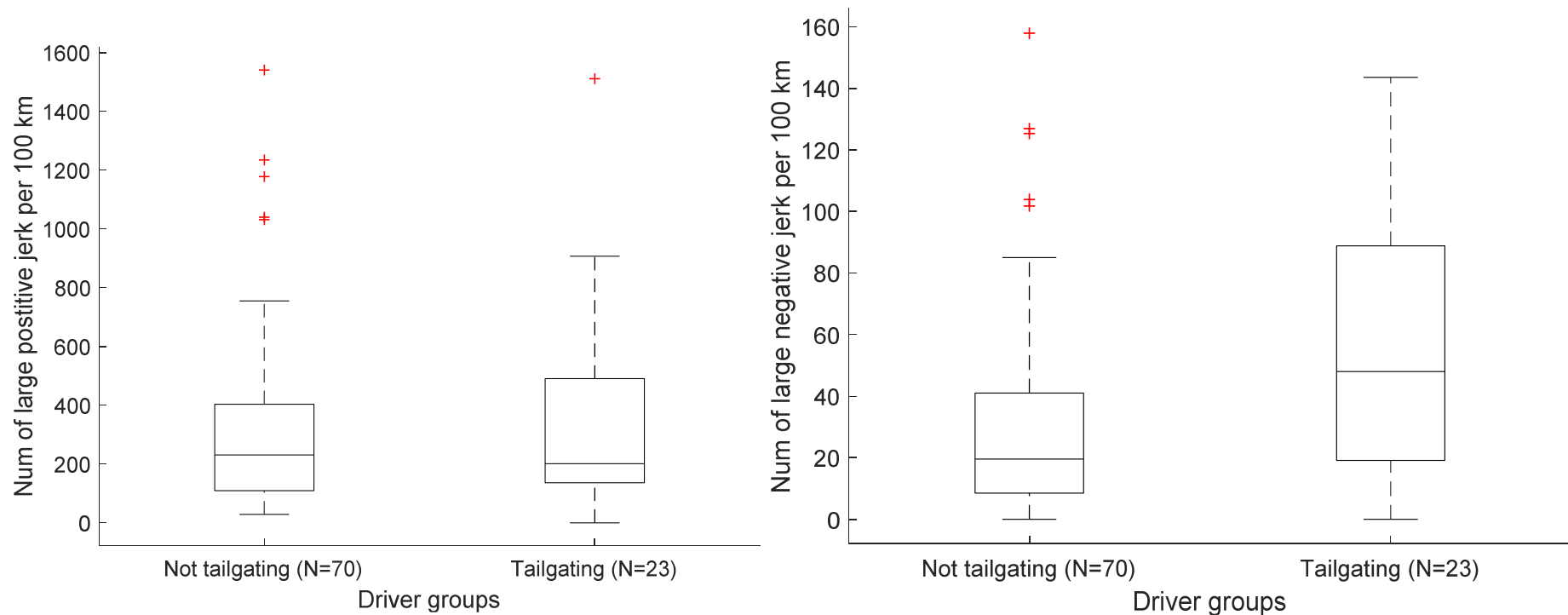




# Results

- Total segments of car-following: 126098
- Distance: 72705 km
- Duration: 758.2 hours
- 93 drivers
  - 50 males and 43 females

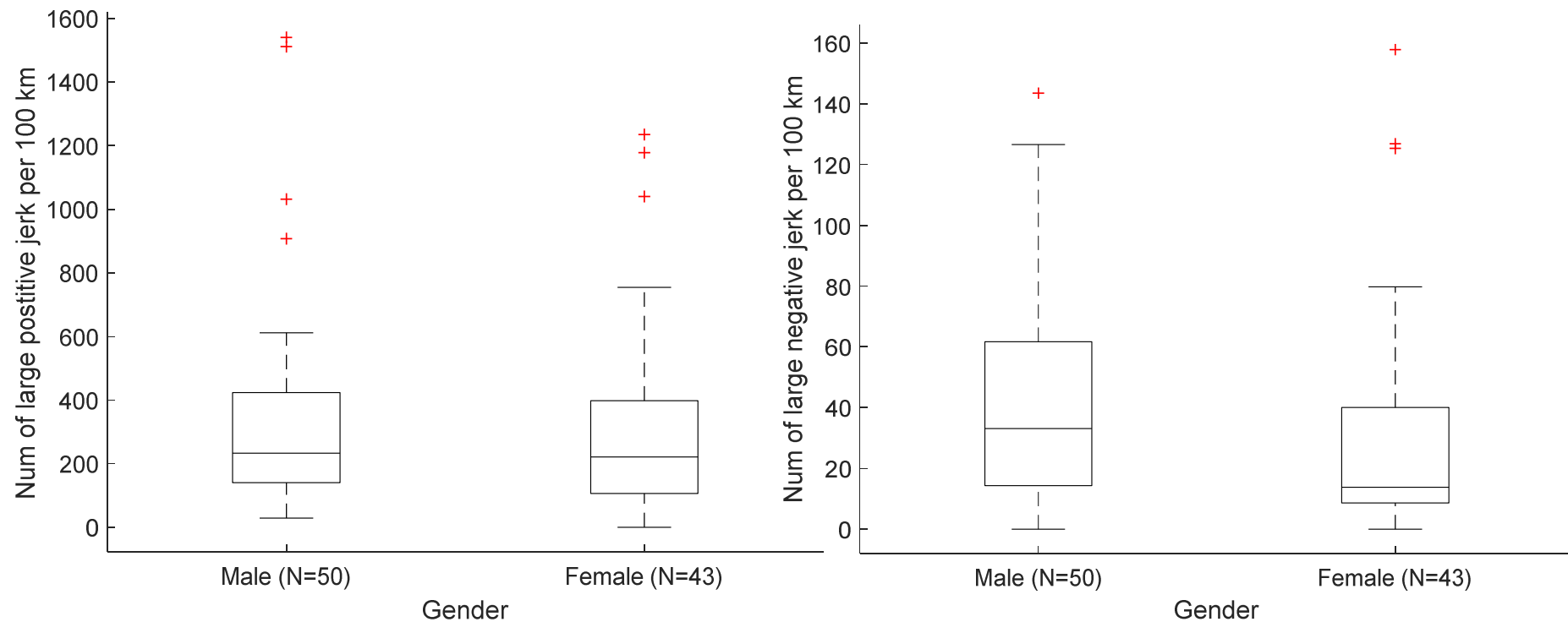
# Jerk and tailgating



K-W:  $\chi^2 (1) = 0.1605, p = 0.6886$

$\chi^2 (1) = 8.3764, p = 0.0038$

# Jerk and gender



K-W:  $\chi^2 (1) = 0.8128, p = 0.3673$

$\chi^2 (1) = 6.0431, p = 0.0139$

# Jerk and country

- Positive jerk

$$\text{K-W } \chi^2 (4) = 20 \text{ } p = 0.00049$$

- Negative jerk

$$\text{K-W } \chi^2 (4) = 19.51 \text{ } p = 0.00062$$

# AISS

- Low AISS group (AISS  $\leq 45$ )
- High AISS group (AISS  $> 45$ )
- Tailgate:
  - Fisher exact **p = 0.0139**
- Positive jerk:
  - K-W:  $\chi^2(1) = 0.2435$ , p = 0.6216
- Negative jerk:
  - K-W:  $\chi^2(1) = 1.5286$ , p = 0.2163

## DBQ

- Low DBQ group (1-3)
- High DBQ group (4-5)
- Tailgate:
  - Fisher exact  $p = 0.8604$
- Positive jerk:
  - K-W:  $\chi^2(1) = 2.8062$ ,  $p = 0.0939$
- Negative jerk:
  - K-W:  $\chi^2(1) = 1.6015$ ,  $p = 0.2057$

# Conclusion

- Aggressive drivers are associated with significantly higher frequency of using large **negative** jerk
- Drivers from different countries have significantly different frequency in using both **positive** and **negative** jerk
- Male drivers have significantly higher frequency of using large **negative** jerk compared to female drivers
- Higher sensation-seeking drivers are more prone to tailgating



**Thank you**